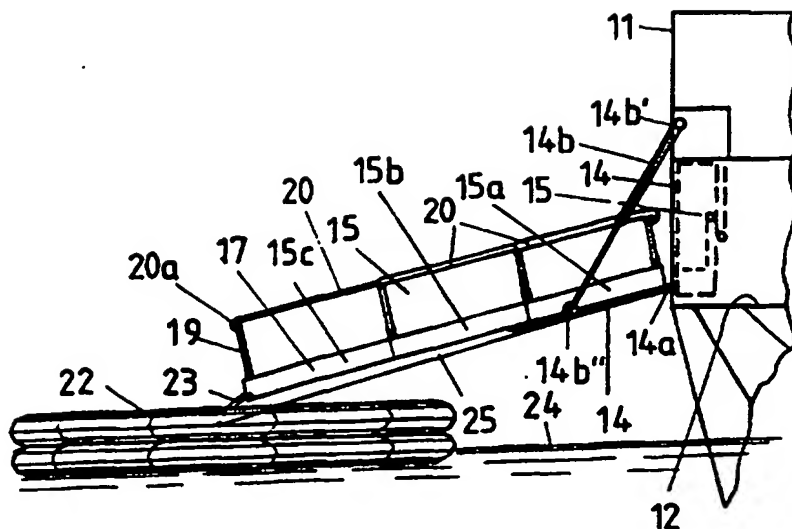




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(54) Title: ARRANGEMENT FOR EVACUATION OF PERSONS FROM A SHIP



(57) Abstract

An evacuation arrangement for evacuation of persons from "express boats", ferries or like vessels, is arranged in the starting position in an inactive position substantially at the level of the deck (12) of the ship. A hatch member (14), which is inlaid in a side (11) of the ship and which is pivotally mounted about a lower substantially horizontal axis (14a), is swingable from an inactive position in the side (11) of the ship to an active use position outside the side (11) of the ship by means of power-driven swinging mechanisms (14b, 14c). The gangway (15) forms carrier means for a raft package (22a) fastened in this, which is readily adjustable from an inactive storage position internally in the ship to an active use position endways outside the gangway (15). It is preferred that the hatch member (14) forms carrier means for a gangway (15) which is telescopically outwardly movable, telescope sections (15a-15c) of which are each provided with two opposite side portions (17-20) and an intermediate rigid bottom (16).

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Arrangement for evacuation of persons from a ship

Present invention relates to an arrangement for evacuation of persons from a ship, especially from passenger ships of the "express boat" type, ferries or the like, where the evacuation arrangement is arranged substantially at deck height.

As a consequence of the relatively low freeboard of the ship passengers can be easily evacuated having the relatively short distance from ship to raft. However there is a need for a simple, operatively reliable and effective arrangement for transferring passengers from ship to raft. There is a need for an arrangement which can be stowed away in an inactive position at a suitable location in the ship in a manner requiring little space. Further there is a need for an arrangement which can be easily and rapidly readjusted from said inactive position internally in the ship to an active use position outside the ship so as to form a safe connection for the transfer of passengers rapidly and effectively between ship and raft.

The arrangement is characterised in that a hatch member, which is inlaid in a side of the ship and which is pivotally mounted about a lower substantially horizontal axis arranged approximately at the level of the deck of the ship, is swingable from an inactive position in the side of the ship to an active use position outside the side of the ship by means of power-driven swinging mechanisms, and that the gangway forms carrier means for a

raft package fastened in this, which is readily readjustable from an inactive storage position internally in the ship to an active use position endways outside the gangway.

5 By combining the hatch member with a gangway having an associated raft, in the form of a closely packed, readily inflatable raft package, the evacuation arrangement can be handled in the easily controllable manner intended, in an inactive storage condition as well as in
10 an active use condition and also in the readjustment phase between the storage and the use phase.

It is preferred that the hatch member forms carrier means for a telescopically outwardly movable gangway, the telescopic sections of which are each provided with two
15 opposite side portions and an intermediate rigid bottom. By allowing the swingable hatch member in the side of the ship to form a carrier means for a telescopically displaceable gangway it is possible to adjust the gangway so that relative to the sea the raft can be held at a
20 suitable distance from the side of the ship, at the same time as obtaining a relatively moderate descending angle between ship and raft.

Further features of the present invention will be evident from the following description having regard to
25 the accompanying drawings, in which:

Fig. 1 shows schematically the evacuation arrangement in an active use position, illustrated in side view,

Fig. 2 shows the same as in Fig. 1, illustrated in perspective view,

30 Fig. 3 and 4 show schematically the evacuation arrangement in side view in respective swung in and swung out inactive positions.

Fig. 5 shows an end view of the rescue arrangement in an inactive storage position,

35 Fig. 6 shows an end view of the rescue arrangement in an active use position,

Fig. 7 shows the rescue arrangement in a perspective view,

Fig. 8 shows schematically and in section an end view of the evacuation arrangement, illustrated in the use position.

Fig. 9 shows in a section of Fig. 6 a detail of the connection of the raft with the gangway, illustrated in two different use positions, shown in full drawn lines and broken lines respectively.

Fig. 10 shows a side view of the gangway in its axially pushed together condition but with the raft in a partially state of readiness.

Fig. 11 shows a section of Fig. 10.

Fig. 12 shows in section a side view of the outer end of the gangway.

Fig. 13 shows in elevation a section of the side of a ship having a frame with an associated pivotally mounted hatch, which is illustrated in a closed position, according to a second embodiment.

Fig. 14 shows in vertical section the hatch, as illustrated in Fig. 13, pivoted outwards at an obtuse angle relative to the hatch opening.

Fig. 15 shows a side view of the hatch and an associated raft, with the hatch opening illustrated in vertical section.

Fig. 16 shows an end view of the hatch.

Fig. 17 shows on a larger scale a cross-section of the telescopically movable parts of the gangway.

A first embodiment will be referred to and described first, as shown in Fig. 1 - 12.

In Fig. 1-4 there is shown a ship's side 11 and ship's deck 12 on a passenger ship, for example on a ferry or so-called "express boat" or on a similar vessel.

In the side 11 of the ship a hatchway 13 is cut out, which is covered by means of a hatch member 14, such as indicated by broken lines in Fig. 1 and by fully drawn

lines in Fig. 3. The hatch member 14 is swingable about a substantially horizontal axis 14a at the lower end of the hatch opening 13.

5 The hatch member 14 is able to be cast out from an inactive vertical position (Fig. 3) to a horizontal out swung position (Fig. 4) by means of two support arm-forming compressed air medium cylinders 14b, 14c, one end 14b' of which is pivotally mounted at the upper portion of the hatchway 13 and the opposite end 14b'' of which is
10 pivotally mounted at the middle portion of the hatchway 14.

In certain instances the hatch member 14 can itself form the gangway, but in order to obtain sufficient distance between raft 22 and side 11 of the ship and in
15 order to obtain a moderate descending angle from the ship to the raft a relatively elongate gangway 15 is preferred.

As shown in the drawings the hatch member 14 forms a part of the gangway 15, which consists of mutually axially, that is to say telescopically displaceable gangway sections 15a, 15b, 15c.
20

In Fig. 3 the hatch member 14 and the gangway 15 are shown with the sections 15a-15c in an inactive folded together condition, so that they take little space. The hatch member 14 and the gangway 15 are shown in a horizontal position in Fig. 4 and 5, in which the gangway is
25 illustrated in an inactive position, still in a folded together state.

The gangway sections 15a-15c are equipped with their respective bottom plate 16, which are carried along the
30 longitudinal edges by a pair of associated lower channel-shaped telescope members 17 of rectangular cross-section. From the telescope member 17 holder means 18 project upwards at right angles with their respective bar-shaped support means 19, which are pivotally mounted about
35 journals 18a of the holder means 18 for swinging from the position shown in Fig. 5 to the position shown in Fig. 6.

Above the support means 19 carry a set of three upper telescope members 20, which in a ready-for-use position, as is shown in Fig. 1 and 2, form the framework of the respective gangway section 15a - 15c. At 20a opposite, somewhat bent over framework ends of the framework are shown.

In a space 21, which is formed between bottom plate 16 of the gangway section 15a and the lower telescope members 17 and holding means 18 plus the folded support means 19 and the upper telescope members 20, an inflatable raft 22 is jammed, in the form of a package 22a, such as shown in Fig. 5. On swinging the support members 19 and the telescope members 20 jointly, from the position shown in Fig. 5 to the position shown in Fig. 6, the inflatable raft package 22a is freely available for swinging outside the gangway and for subsequent inflation to the usual form of a raft.

For the sake of simplicity the raft package 22a is omitted in the position illustrated in Fig. 6, 7 and 8.

After the hatch member 14 is swung outside the hatch opening 13 to the position shown in Fig. 4 sections 15a - 15c of the gangway 15 are readjusted manually to the position shown in Fig. 6. Thereafter the sections 15a - 15c are pushed axially outwards by means of a piston/cylinder arrangement 38. Finally the raft package 22a is swung about a pivot arm arrangement 23 at the outer end of the section 15c to a position outside the gangway and the raft is inflated to the ready-for-use position, while sections 15a -15c of the gangway are simultaneously pivoted outwards and downwards towards the surface 24 of the sea via the piston/ cylinder arrangements 14a,14b to the position shown in Fig. 1 and 2. the raft 22 is reinforced and buttressed relative to the gangway 15 by means of stays 25, as shown in Fig. 2.

In a first embodiment, as shown in Fig. 1-8, the pivot arm arrangement 23 is in the form of a U-shaped loop 26. The central web 26a of the loop 26 forms a fastening for the raft package 22a. Opposite legs 26b, 26c of the loop 26 are swingable at the outer ends about a horizontal axis of respective lower telescope members 17 of the gangway section 15c. In Fig. 2 the loop 26 is shown in a swung about condition relative to the starting position, which is illustrated in Fig. 5, 6 and 8. The raft package 22a is fastened to the web portion 26a of the loop 26 in a manner not shown further. In practice however the fastening can be designed correspondingly as shown in a second embodiment, which will be described further during reference to Fig. 9 - 12.

In the second embodiment, as shown in Fig. 9 - 12, the pivot arrangement 23 is in the form of a pair of separate L-shaped pivot arms 27, one end of which is rigidly fastened in a fitting 28, which includes the raft package 22a, and the other end of which is pivotally mounted in a holder 35 (see Fig. 11 and 12) opening obliquely downwards.

One end of the pivot arms 27 is, as shown in Fig. 10, fastened separately to a central portion of a middle section 22b of the raft 22 via respective fittings 28. The raft section 22b with the fittings 28 form a part of a peripheral portion of the raft package 22a, so that the raft package 22a can be swung about via the fittings 28 from the position shown in broken lines to the position shown in fully drawn lines in Fig. 11.

In Fig. 9 and 12 the raft package 22a is shown in a schematic manner in the form of a cylindrical package, which in a manner known per se bursts open during the inflation of the raft. In the finished inflated state the central portion 22b of the raft 22 is anchored via the fittings 28 and the pivot arms 27 to the outer end of the

gangway 15, so that the weight loading from the gangway is transferred to the middle of the central portion 22b of the raft.

5 The fitting 28 comprises a curved, rigid plate 30, which is vulcanised into the material, which the raft package 22a is composed of. When the package 22a assumes the starting position, as shown in broken lines in Fig. 11, the package is axially packed together internally in the section 15c and can have for example a somewhat curved
10 outline. In a freely downwardly hanging, 180° swung about position, as shown in the fully drawn lines in Fig. 11, the raft package 22a assumes on the other hand - still in the uninflated condition - a substantially cylindrical, axially outstretched form, which is in readiness for
15 inflation.

The fitting 28 is equipped on its upper side (see Fig. 11 and 12) with an angular profile 32, which forms carrier means for the associated pivot arm 27. The pivot arm 27 is provided at the opposite end with a head portion
20 34, which is pivotally mounted in the holder member 35, so that the fitting 28 can be swung about, as shown by the arrow A from the position shown in broken lines to the position shown in fully drawn lines in Fig. 11.

25 The holder member 35 is, as shown in Fig. 12, fastened to a supporting axle 36, which passes through a transverse beam 37 at the outer end of the gangway section 15c.

In Fig. 9 and 10 there are shown a pair of pneumatically driven piston/cylinder arrangements 38a and
30 38b extending mutually in parallel, which are fastened to the middle gangway section 15b. the piston/ cylinder arrangements 38a, 38b are adapted to displace the two remaining gangway sections 15a and 15b telescopically in opposite directions towards and from the middle gangway
35 section 15b.

The support axle 36 of the holder member 35 is integrated in the outer end of the piston/cylinder arrangement 38a. By effecting the outward sliding of the piston/cylinder arrangement 38a the holder member 35 is consequently also pushed out and ensures thereby the accompanying pushing out and swinging about of the raft package 22a. This is ensured due to the length of movement of the gangway section 15c being limited by means of stop arrangements and thereby being shorter than the length of movement of the piston/cylinder arrangement. According to the construction as shown in Fig. 9 - 12 the pivot arms 27 are thereby forced to swing about from the position shown in broken lines to the position shown in fully drawn lines in Fig. 11, simultaneously as the telescope members 15a - 15c are pushed axially outwards relative to each other.

According to the construction as shown in Fig. 1 - 8, the loop 26 can correspondingly be forced to swing about from the position shown in Fig. 8 to the position shown in Fig. 1.

By means of compressed air one can one after the other cast out the piston/cylinder arrangements 14b, 14c, axially displace the sections 15a - 15c telescopically outwards and swing about the raft package 22a to a position hanging freely downwards, as shown in Fig. 12 and thereafter by means of a gas cartridge inflate the raft package 22a to the finished raft 22, as shown in Fig. 1 and 2.

The individually pivotally mounted pivot arms 27 ensure a favourable, controlled possibility of movement for the raft 22 relative to the associated vessel, head portions 34 of the pivot arms 27 separately forming an approximate universal joint connection between raft 22 and bridge construction 15.

At 33 a release hook is shown for manual release of the head portion 34 of the pivot arm 27 from the holder member 35. By actuating release hooks 33 of the pivot arms

27 in one and the same operation, the raft 22 can be released by a simple hand grip from the gangway 15, so that the raft can be released and form a separate raft. The release hook 33 and the head portion 34 of the pivot arm 27 can cooperate in a corresponding manner as in a coupling arrangement known per se between for example a passenger car and a trailer.

In a second embodiment, as shown in Fig. 13 - 17, modified details of the first embodiment, which is shown in Fig. 1 - 12, are illustrated. Reference is made in the following to like parts with like reference numerals in the two embodiments, while for modified components according to the second embodiment reference numerals are employed increased by the number "100'.

In Fig. 13 a frame 100 is shown in a side 10 of the ship for the reception of a hatch member 114 able to be cast out. The hatch member 114 is pivotally mounted about a horizontal axis 14a via a pair of hinges 101,102 at the lower edge of a hatch opening 113. The hatch member 114 is longitudinally reinforced by means of a pair of C-shaped beams 103,104, which form fastenings for the hinges 101,102.

As shown in Fig. 14 the hatch opening 113 is designed with a lower extension 105a a distance below deck 12 of the ship. Consequently a hatch opening 113 can be obtained, which exceeds the height between the deck 12 and an overlying deck 112 and which simultaneously gives a correspondingly increased longitudinal dimension to the hatch member 114, which supports a gangway 115.

In a side face 106 in an extension 113a of the hatch opening the one end of a bridge-forming change ramp 108 is pivotally mounted in a bearing 107 about a horizontal axis 113a'. The ramp 108 forms an easily adjustable connection between the deck 112 and the gangway 115. In this connection the ramp 108 forms at its free outer end, via a support roll 109, a support abutment against an upwardly

facing roll surface on each of a pair of telescope members 115a in the gangway 115. The gangway 115 is, correspondingly as in the first embodiment, constructed of equivalent telescope sections 115a, 115b, 115c. In the bearing 107 there is arranged a spring (not shown further), which tensions the ramp 108 for supporting abutment against associated roll paths on the gangway 115. The ramp 108 forms a graduated connection between the deck 12 and the doorstep foundation of the gangway 115 and is adapted to automatically assume a change position which is independent of the position of the gangway or movement relative to the sea.

The one (14b) of two pressure medium cylinders 14b,14c is shown, which at the one end is rotatably mounted in a first bearing 14' just within the hatch frame 100 and at the opposite end, that is to say at the outer end of the associated piston rod, is jointed via a second bearing 14'' in the gangway 115. By means of the pressure medium cylinders 14b,14c the gangway can be readjusted in various angular positions as required by remote control from a position for example just by the hatch opening.

In Fig. 14 there is shown the one of a set of two locking mechanisms 140, which are arranged along each side edge of the hatch member 114 and which are adapted to engage respective locking grooves 141 in the hatch frame 100. Two lock pawls 140a and 140b are shown, which are controlled by a common hydraulic cylinder 140c via associated piston rod 140d. Immediately the locking mechanisms 140 have nullified their locking engagement with the hatch frame 100 the hatch is ready for swinging to the outswung position, which is illustrated in Fig. 14, and ready for pushing out the telescope sections 115a - 115c, as shown in Fig. 15.

In Fig. 15 there is shown a pressure medium accumulator 142 which is connected via a pressure conduit 142a to the associated pressure medium cylinder 14b. A

corresponding pressure conduit can connect the accumulator 142 to the remaining pressure medium cylinder 14c. The telescope sections 115a, 115b, 115c are moved outwardly by manual control to an appropriate oblique position relative to the ship by means of pressure medium cylinders 38a, 38b (see Fig. 16), which provide for fixing and locking of the telescope sections in such an intended pushed out position.

When the telescope sections 115a, 115b, 115c assume their fully pushed out use position, as shown in Fig. 15, a signal is emitted from the same, which activates a valve 143 in the pressure conduits 142a between the accumulator 142 and associated cylinders 14a, 14b. The activation of valve 143 involves the accumulator 142 being connected to the one work chamber, that is to say to the negative side of the cylinders 14b and 14c. By means of the accumulator 141 the telescopic gangway can hereby be allowed to be able to follow the wave movements of the raft 22 at the same time as the rolling movements or rocking movements of the ship are compensated for, without producing unnecessary loadings in the gangway 115 or its connections to the raft 22.

When the raft 22 is uncoupled from the gangway 115 via associated rapid coupling 35, 37 (see Fig. 9 - 12) the accumulator 141 cooperates to automatically pivot the hatch 114 upwards from the raft by neutralising the weight from the raft 22. Crew or passengers can hereby be prevented from being hurt in the raft on evacuation in high seas.

In Fig. 16 an arrangement is shown with a cassette 144 with an associated longitudinally displaceable lid 145 arranged in a cavity between the upper side of the hatch 114 and the under side of the gangway 115. In a space, which is defined between the cassette 144 and the lid 145, the raft 22 is received in a packed together condition. The lid 145 can for example be fastened to the innermost

telescope section 115a, while the cassette 144 itself can be fastened to the outermost telescope section 115c, so that the lid 145 on outward sliding of the telescope sections can be displaced automatically relative to the cassette 144 and can thereby uncover an access opening in the cassette 144, so that the raft is in readiness for inflation and exposure via an equivalent cavity in the bottom part of the telescope section 115c.

The operation of the gangway and the raft is preferably effected in the following manner:

By way of introduction the locking mechanism is nullified by actuation of a first operating button of an on/off breaker and the cylinders 14b, 14c are activated, so that the hatch 114 is pivoted outwards, as shown in Fig. 14.

Thereafter a second operating button is actuated, which activates the cylinders 38a, 38b, so that the telescope sections are pushed out to the outer position, as shown in Fig. 15.

By means of a third press button the movement of the telescope sections can be controlled in an inwardly directed or outwardly directed movement as required.

A release line (not shown further herein) is employed for release of the inflation function of the raft at an appropriate phase during the outward sliding of the telescope sections towards their illustrated outer position, that is to say in a position where the lid 145 completely or partially uncovers the access opening to the cassette 144. One end of the release line is fastened at the hatch opening, so that the inflation starts automatically at an outwardly pushed position of the telescope sections 115a - 115c established beforehand.

A corresponding pull wire 147 is fastened at the hatch opening and provides for a framework-forming wire 148 to be stretched in extension of the pull wire and

provides for framework poles 119 to be raised from a horizontal to a vertical position to form a continuous framework 119, 148, 147.

Patent Claims

1. Arrangement for evacuation of persons from a ship, especially from passenger ships of the "express boat" type, ferries or the like, where the evacuation arrangement is arranged substantially at the level of the deck (12,112) of the ship, characterised in that

a hatch member (14,114), which is inlaid in a side (11) of the ship and which is pivotally mounted about a lower substantially horizontal axis (14a,114a), which is arranged approximately at the level of the deck (12) of the ship, is swingable from an inactive position in the side (11) of the ship to an active use position outside the side (11) of the ship by means of power-driven swinging mechanisms (14b,14c), and

that a gangway (15,115), which is fastened to the hatch member (14,114) forms carrier means for a raft package (22a) fastened in this, which is readily readjustable from an inactive storage position internally in the ship to an active use position endways outside the gangway (15,115).

2. Arrangement in accordance with claim 1, characterised in that the hatch cover (14,114) forms carrier means for a telescopically outwardly slidable gangway (15,115), telescope sections (15a - 15c; 115a - 115c) of which are each provided with two opposite side portions (17 - 20) and an intermediate rigid bottom (16).

3. Arrangement in accordance with claim 1 or 2, characterised in that in the inactive position the raft package (22a) is jammed to the gangway (15) by means of laterally foldable framework members (19,20), which in the use position of the gangway (15) are unfolded to form a framework on the gangway (15).

4. Arrangement in accordance with claims 1 or 2, characterised in that the raft package (22a) is received in an inactive position shielded in a cassette (144) having an associated lid (145), and

5 that the cassette (144) and the lid (145) are fastened to their respective telescope section (115c,115a) for automatically removing the lid (145) from the cassette (144) by relative displacement of the telescope members (115a - 115c).

10 5. Arrangement in accordance with one of the claims 1 - 4, characterised in that the raft package (22a) or the raft (22) is fastened pivotally mounted to the gangway (15,115) at the outer end of the outer section (15c,115c) of the gangway (15,115),

15 the central axis of the raft package (22a) or the raft (22) in the use position of the raft (22) being adapted to assume a position vertically below the outer end of the gangway (15,115).

20 6. Arrangement in accordance with claim 5, characterised in that the raft package (22a) or the raft (22) is pivotally mounted to the outer end of the gangway (15,115) via two separately swingable pivot arms (27) which are arranged at a certain distance from each other, to form a universal joint-like pivot arrangement between the outer end of the gangway (15,115) and the associated raft package/raft.

30 7. Arrangement in accordance with claim 1 - 6, characterised in that the hatch member (14,114) is swingable and closeable in specific, regulatably swingable positions, relative to the deck (12,112) of the ship, by means of the power-driven swinging mechanisms, which

comprise a pair of opposite piston/cylinder arrangements (14b,14c), for example hydraulically driven or air- or gas-driven arrangements.

5 8. Arrangement in accordance with one of the claims 1
- 7, characterised in that in their positioned positions
the cylinder arrangements (14b,14c) are automatically
longitudinally readjustable in step with the movements of
the waves which are transferred to the gangway (115) from
10 the raft,

one working chamber of the cylinder arrangements
(14b,14c) being connected to a pressure accumulator (141)
which ensures a cushioned readjustment movement for the
cylinder arrangements.

15 9. Arrangement in accordance with one of the claims 1
- 7, characterised in that in their positioned positions
the cylinder arrangements (14b,14c), after release of the
raft (22) from the gangway (115), are automatically
20 longitudinally contractable,

one working chamber of the cylinder arrangements
(14b,14c) being connected to a pressure accumulator (141)
which ensures automatic swinging of the gangway (115) to a
position substantially above the raft (22), by the missing
25 weight loading from the raft (22) after release of the
raft (22) from an engagement with the gangway (115).

FIG. 1

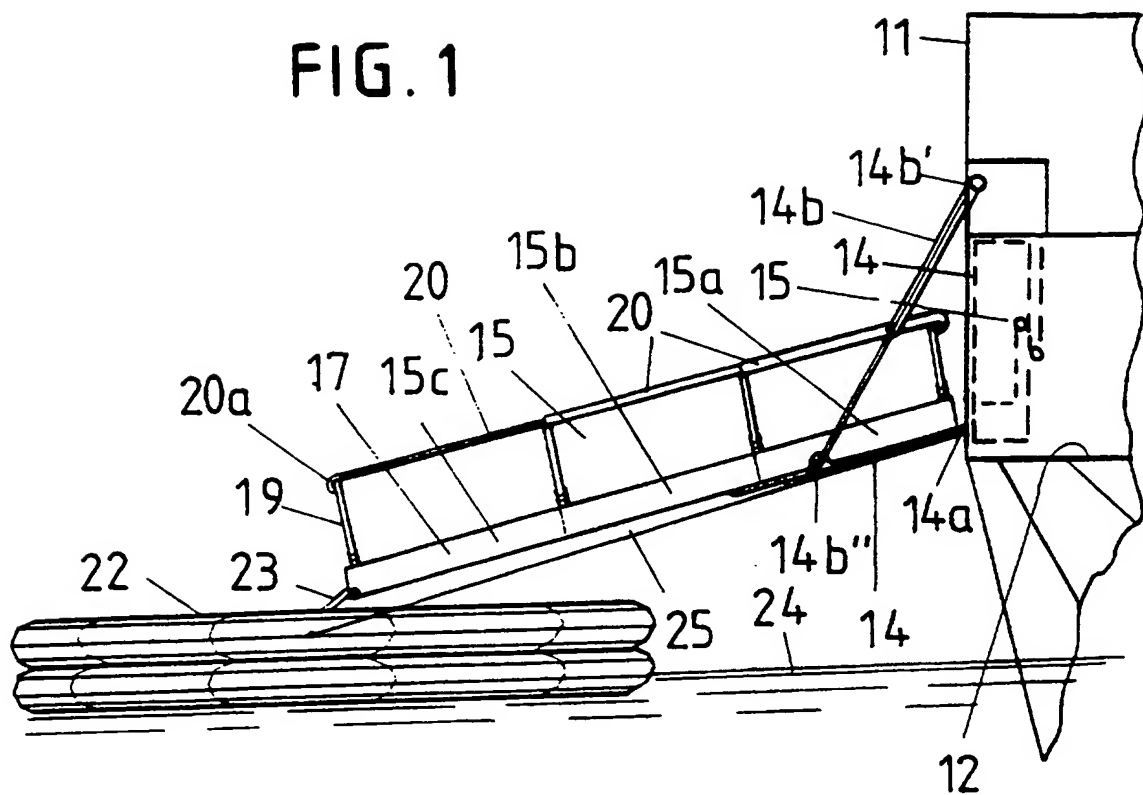


FIG. 2

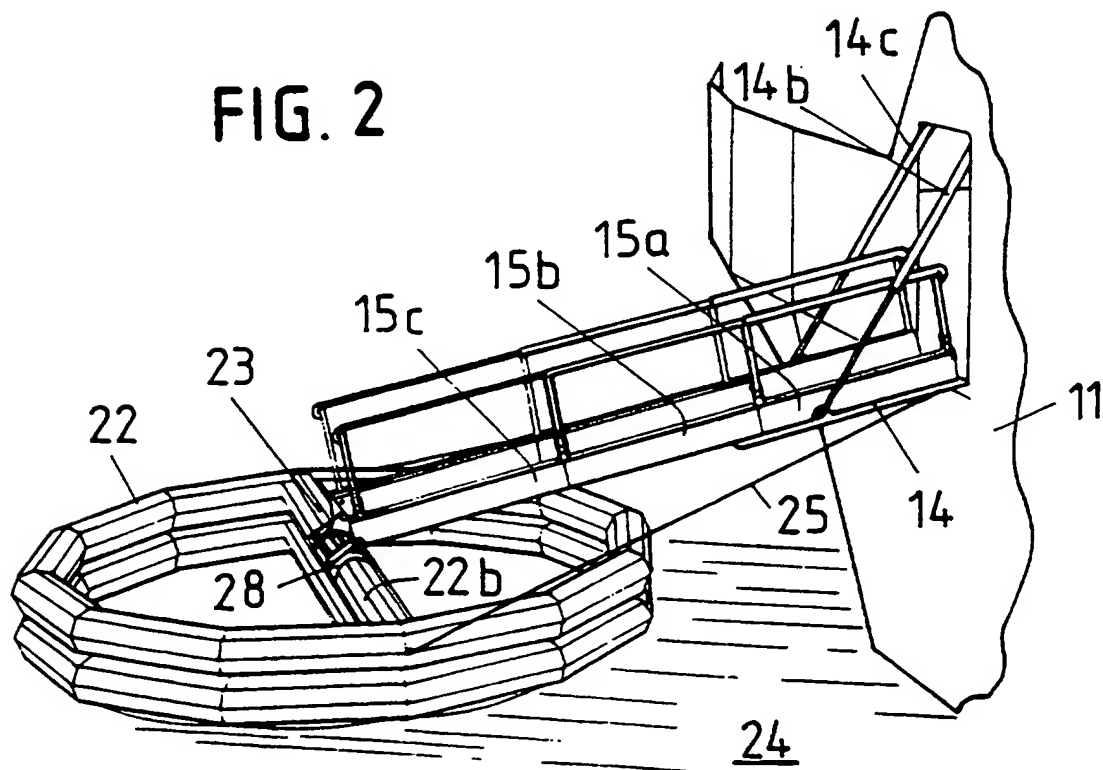


FIG. 3

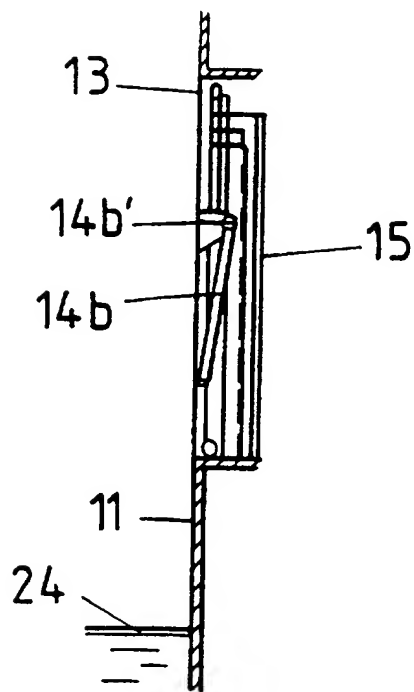
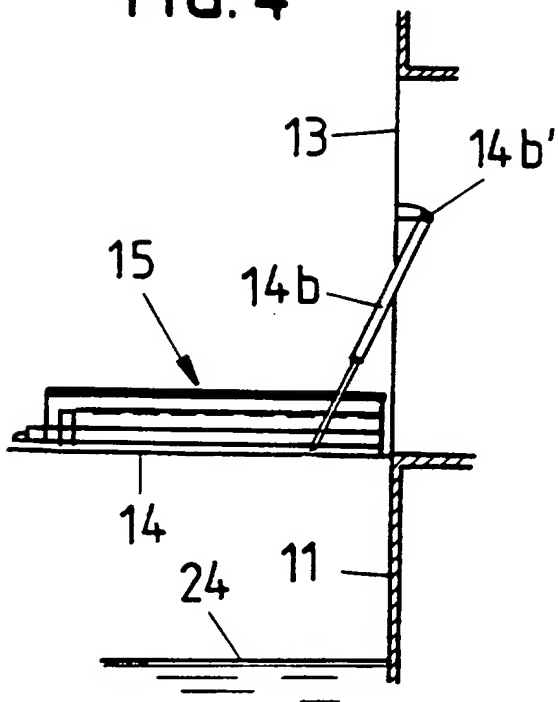
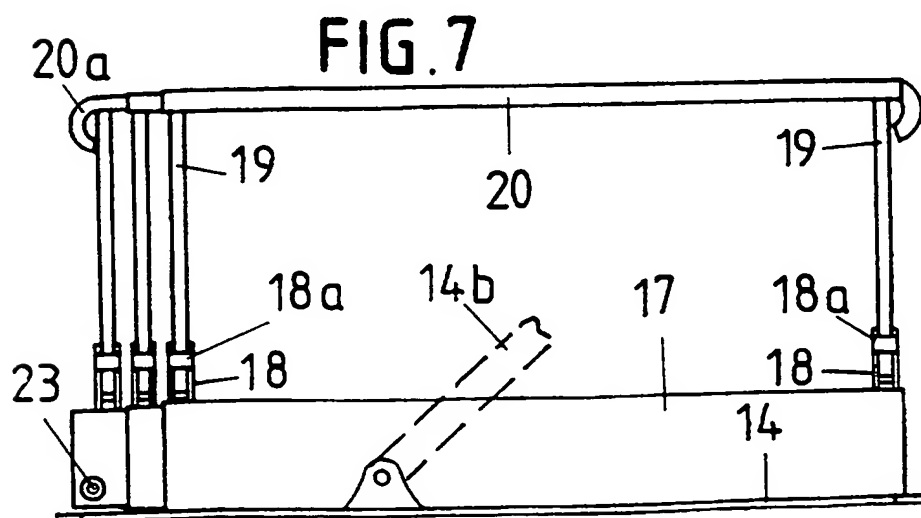
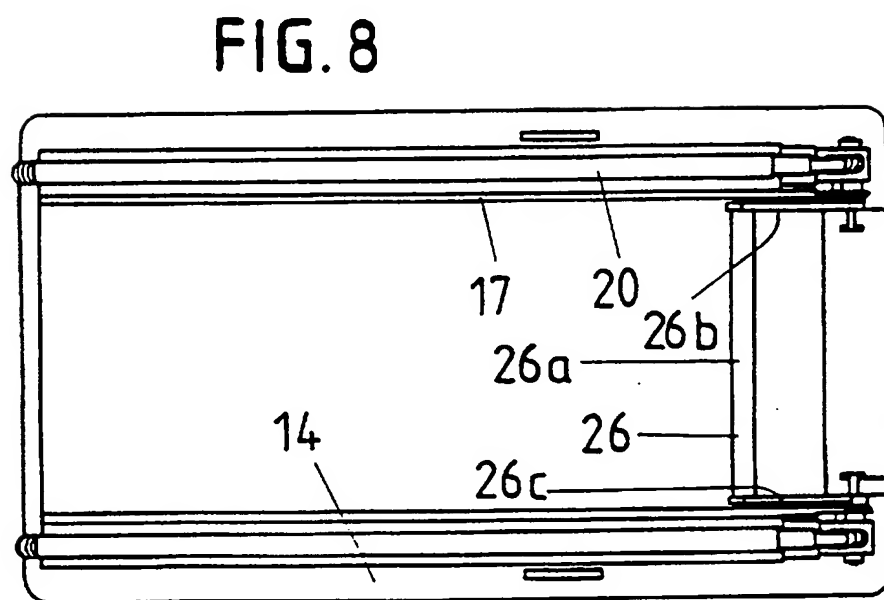
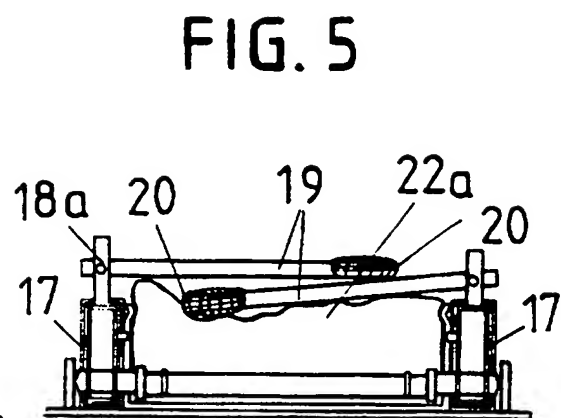
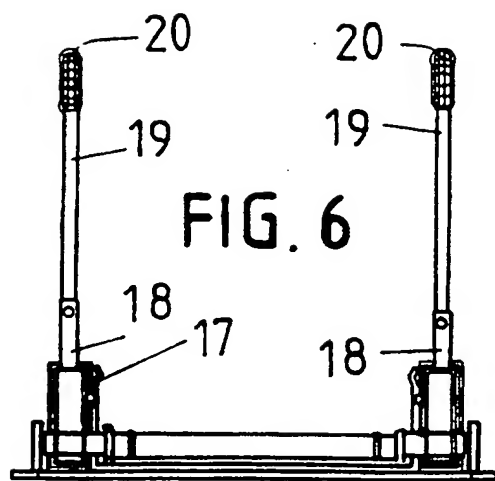


FIG. 4





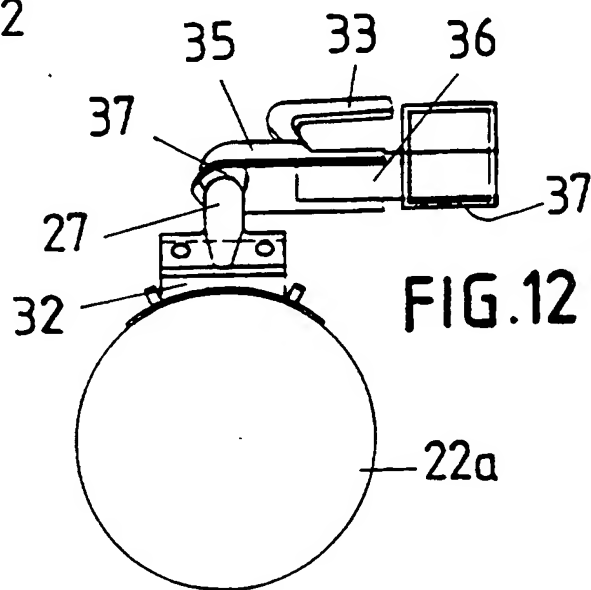
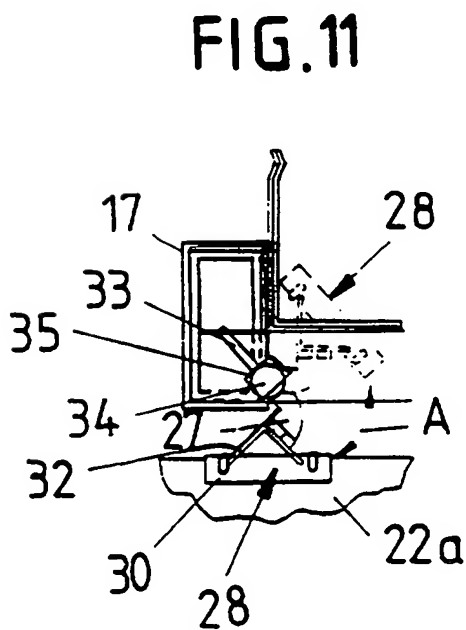
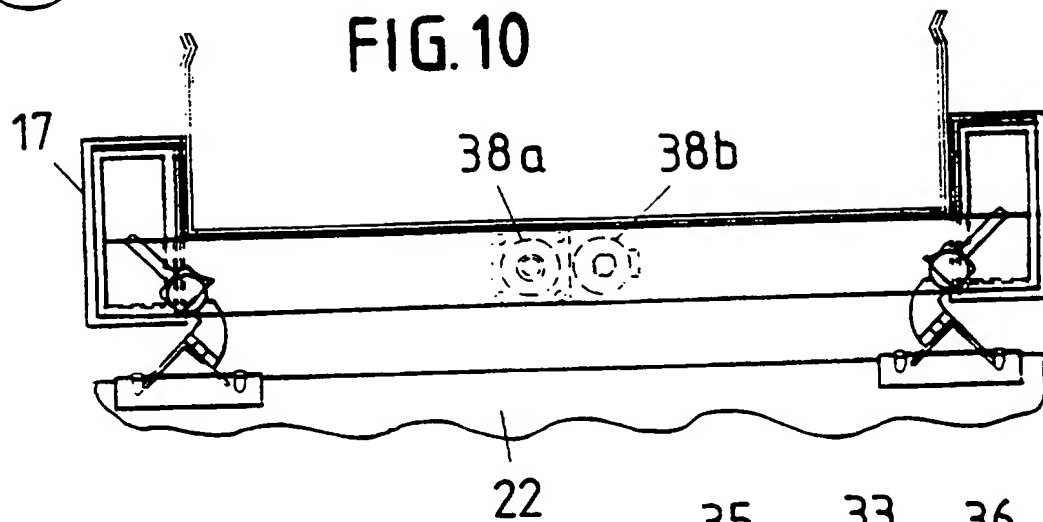
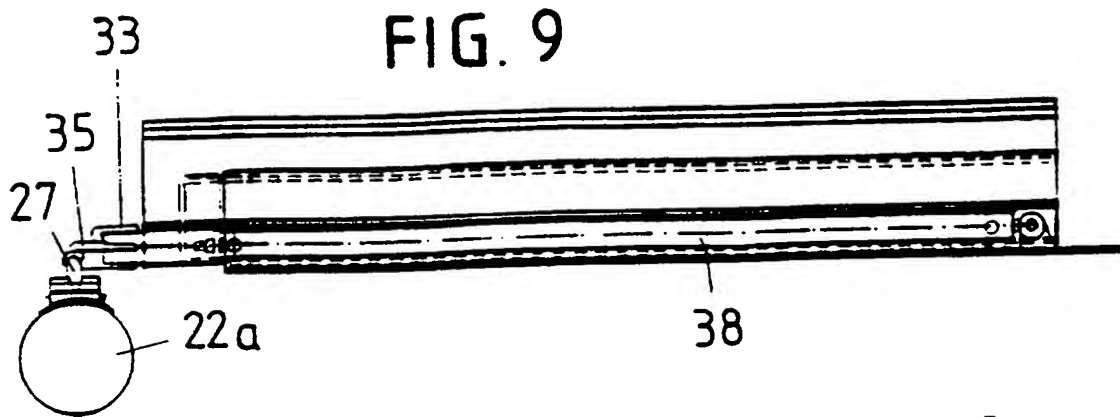


FIG. 13

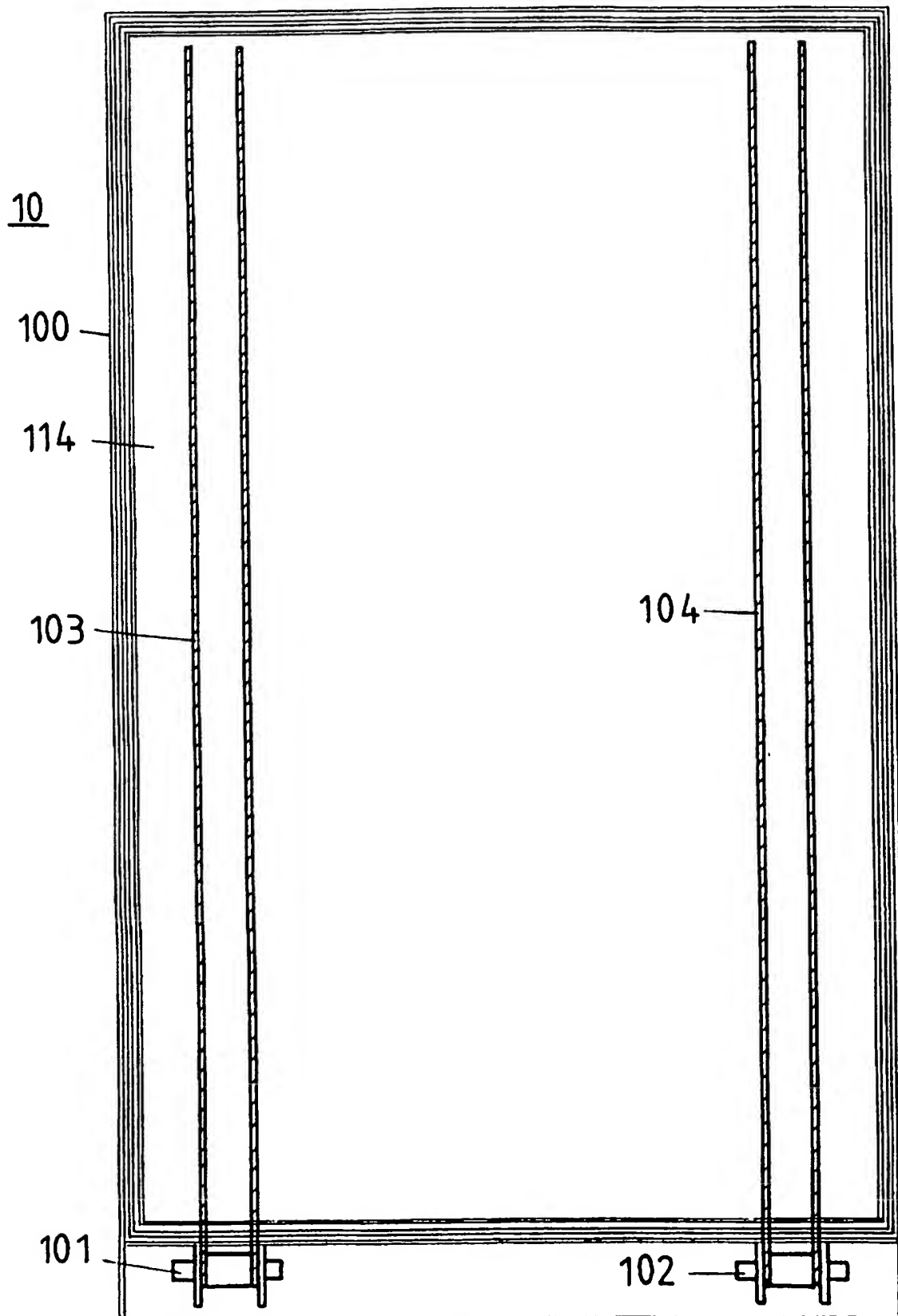


FIG. 15

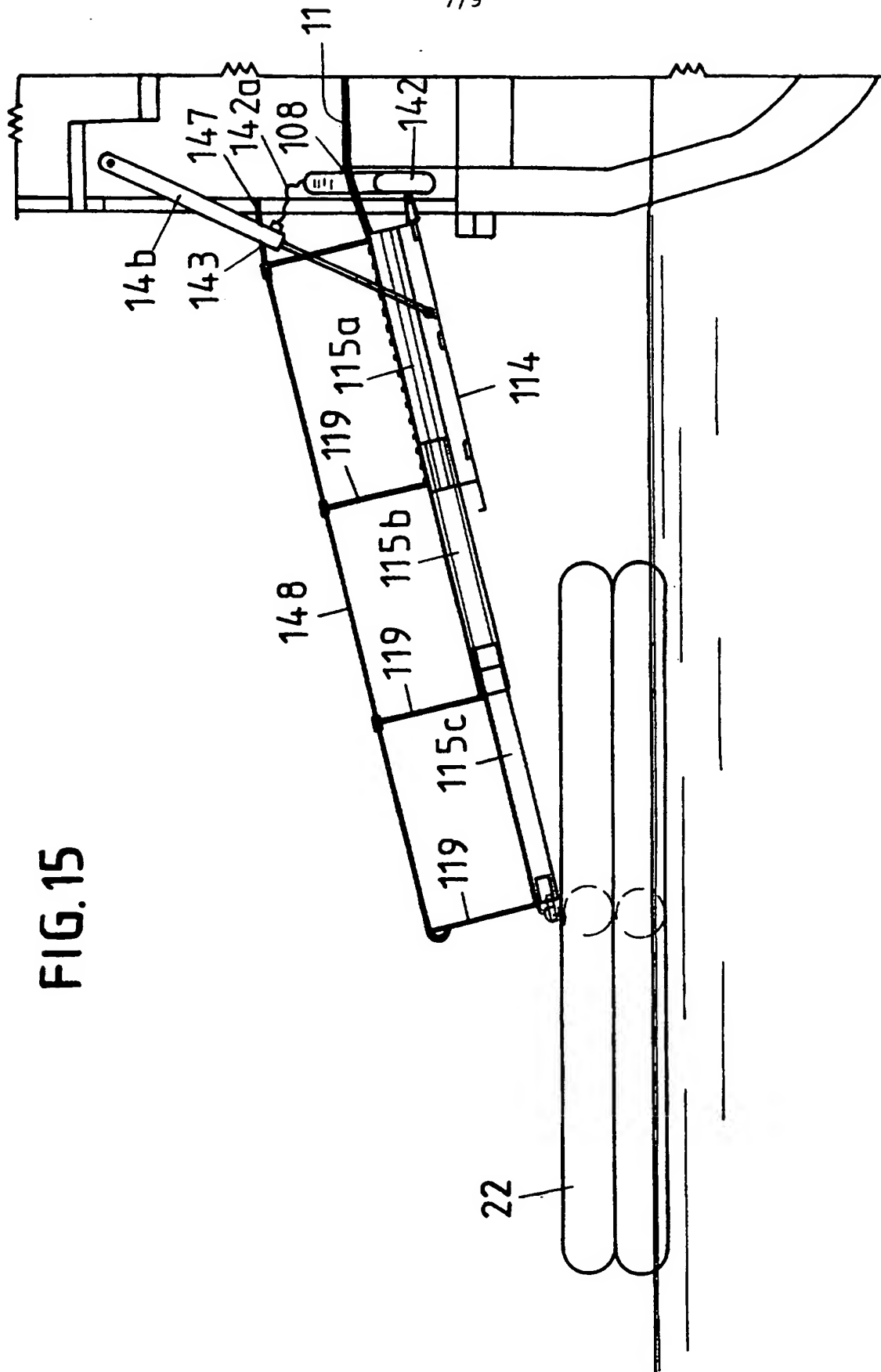


FIG.16

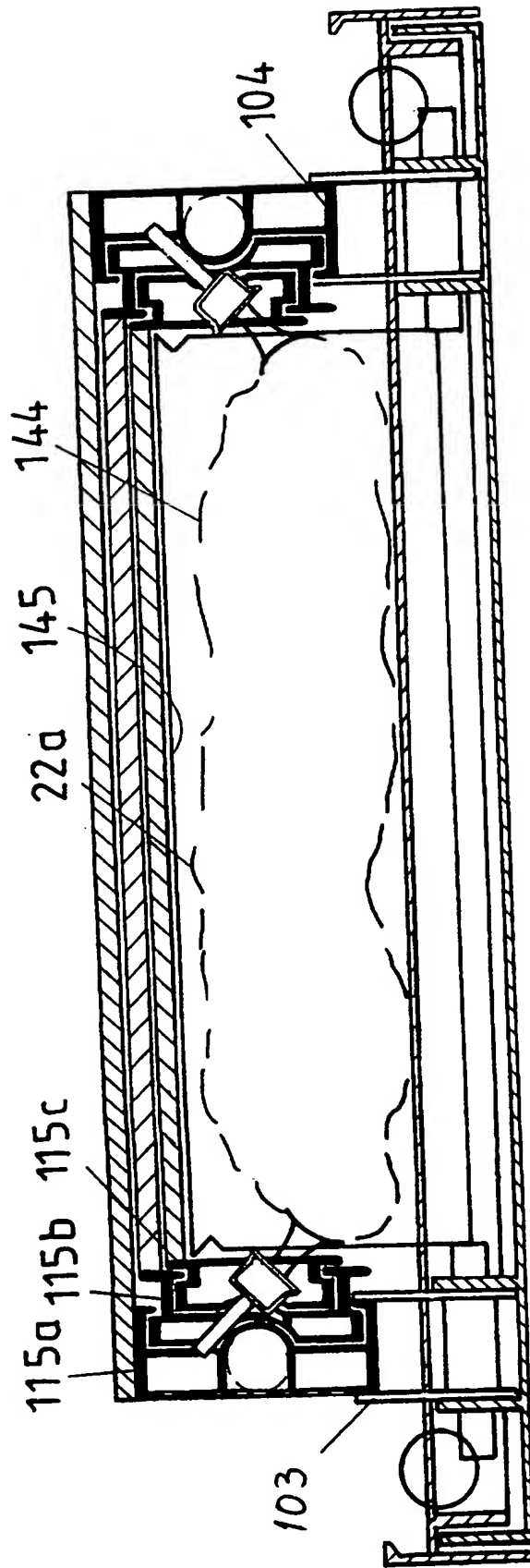
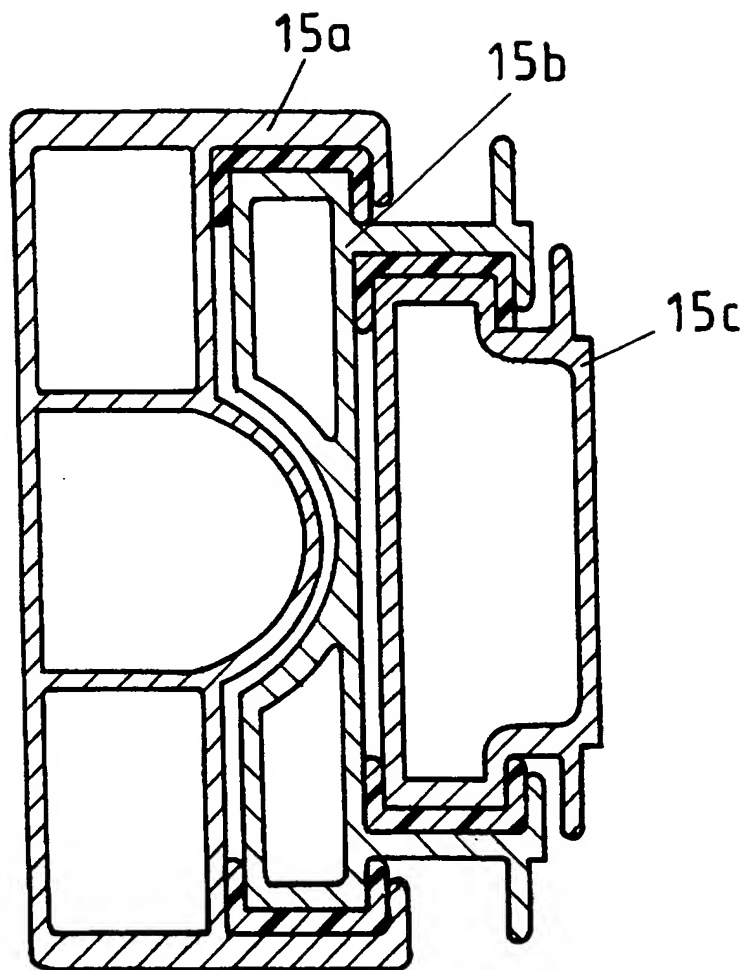


FIG. 17



INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 96/00303

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B63B 27/14, B63C 9/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A62B, B63B, B63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| A | WO 9514605 A1 (LIFERAFT SYSTEMS AUSTRALIA PTY. LIMITED), 1 June 1995 (01.06.95) -- | 1 |
| A | GB 2105264 A (RFD INFLATABLES LIMITED), 23 March 1983 (23.03.83) -- | 1 |
| A | GB 2131369 A (RDF LIMITED), 20 June 1984 (20.06.84) -- | 1 |
| A | GB 2155877 A (OSCAR AANENSEN), 2 October 1985 (02.10.85) -- | 1,2 |

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

22 July 1997

Date of mailing of the international search report

23 -07- 1997

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 96/00303 -

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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| A | DE 3609333 A1 (KVAERNER BRUG (DEUTSCHLAND) GMBH), 17 Sept 1987 (17.09.87) -- | 1,7 |
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INTERNATIONAL SEARCH REPORT

Information on patent family members

01/07/97

International application No.

PCT/NO 96/00303

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| | | | | US 4602697 A | 29/07/86 |
| DE | 3609333 | A1 | 17/09/87 | NONE | |
| DE | 3318118 | A1 | 24/11/83 | NONE | |